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OBTAINING CYCLOPENTANONE FROM ACIDIC WASTEWATER OF CAPROLACTAM PRODUCTION

I. V.Tsvetkova, A. A. Golovanov, N. S. Reznikova
II.
Togliatti State University, 14 Belorusskaya St, Togliatti, Samara region, 445020.
E-mail: irina.cvetkova.56@mail.ru

Abstract. The process of oxidation of cyclohexane with atmospheric oxygen, carried out as a separate stage in the production of caprolactam, is characterized by a large amount of oxygen-containing compounds, which are concentrated in acidic wastewater. One of these compounds is adipic acid.[1]

The resulting calcium salt of adipic acid decomposes during high-temperature processing to cyclopentanone. Cyclopentanone is an important intermediate in the production of insecticides, biologically active pharmaceuticals. Ketocyclopentane is an intermediate in the synthesis of jasmon. In the pharmaceutical industry it is a precursor in the production of cyclopentobarbital, which is a sedative. Cyclopentanone is also used to produce cyclopentamine, which is an intermediate in the synthesis of fungicides such as pencycuron.[2]

The solid concentrate of acidic wastewater was diazomethylated to obtain methyl esters of carboxylic acids. The analysis was carried out on a Kristallux 4000M chromatograph with a flame ionization detector (capillary column, carrier gas – helium, quartz, DB-WAX (PEG), 30 m / 0.32 mm / 0.5 μm, maximum thermostat temperature 240 °C) showed that the solid residue of the acidic wastewater from the production of caprolactam contains up to 94% of adipic acid.

Calcium adipate was synthesized from the resulting product. The thermal stability of calcium adipate was studied on a Shimadzu DTG-60 / 60H derivatograph, and the initial temperature of its decomposition was determined, which was 400 °C. The thermal effect of the decomposition reaction is 5.68 kJ / g. The pyrolysis of calcium adipate in a quartz reactor was carried out, the yield of cyclopentanone was calculated, which was 51% of the theoretical.

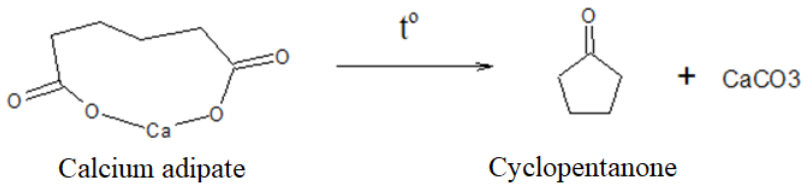

Figure 1. Decomposition reaction of calcium adipate

The resulting product was chromatographed. The retention time of the technical sample of cyclopentanone is 6.24 minutes versus 6.20 minutes for the sample of cyclopentanone with a content of 99.6%. The difference between the retention times of the standard sample and the technical one may be due to the presence of impurities in the second one. The purity of technical cyclopentanone is 96.4%.

References

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